



**Defense Research, Development, Test, and
Evaluation (RDT&E)
Online System (DROLS) Replacement
Graphical User Interface (GUI) Design Group
Final Report**

DTIC TR-98/8

July 1998

Defense Information Systems Agency
Defense Technical Information Center
Directorate of Information Science & Technology
8725 John J. Kingman Road, Suite 0944
Fort Belvoir, Virginia 22060-6218

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13. ABSTRACT (Maximum 200 Words) The GUI Design Group was formed in the Fall of 1997 to examine the needs of users and design techniques for WWW browser-based GUIs. The objective was to design a set of functional screens for a generalized Defense Research, Development, Test and Evaluation (RDT&E) Online System (DROLS) Replacement system. DTIC online retrieval systems (e.g. STINET and Web-enabled DROLS) would then use this generalized interface as a starting point for their interfaces, deciding which elements to incorporate depending on the functionality of the retrieval systems and any unique functions of the system. Graphics could be added later for each system. A short bibliography and sample functional screens are included.			
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I. Purpose of the GUI Design Group

The GUI Design Group was formed in the Fall of 1997 to examine the needs of users and design techniques for World Wide Web (WWW) browser-based GUIs. The objective was to design a set of functional screens for a generalized Defense Research, Development, Test and Evaluation (RDT&E) Online System (DROLS) Replacement system. DTIC online retrieval systems (e.g. STINET and Web-enabled DROLS) would then use this generalized interface as a starting point for their interfaces, deciding which elements to incorporate depending on the functionality of the retrieval systems and any unique functions of the system. Graphics could be added later for each system. Since STINET was in the midst of being redesigned and converted to Fulcrum at this same time, much of the discussion was directed at the STINET user community as examples.

II. Background

DTIC's user base is changing. Traditionally, users of DTIC's online systems were librarians, who served as information intermediaries for scientists, engineers, and managers. However, this environment is changing as Web technology becomes more prevalent and as both DoD and the DoD contractor community is downsizing. More of DTIC's current and potential users, whether they are novice or expert, are looking to the Web for their information needs. With fewer DoD libraries, more end-users are searching on their own. Where librarians are still available, they are finding their jobs changing to help users with complex searches, leaving the end-users to perform straight-forward searches themselves. End-users often search on an occasional basis, and are not willing to learn command-driven interfaces. DTIC needs to meet the expectations of these new users, as well as meet the needs of its traditional community.

III. Approach

Participants in the Group were from the Directo  re of Operations, STINET Management Division (DTIC-OS); Directorate of Information Science and Technology, DROLS Replacement Program Management Office (DTIC-E (DR-PMO)); Directorate of User Services, Product Management Branch

(DTIC-BCP); Directorate of User Services, Reference and Retrieval Services branch (DTIC-BRR); and Directorate of User Services, Network Services Branch (DTIC-BRN). The Group was considered a joint project of the STINET Management Division and the DROLS Replacement Program Management Office (PMO).

The participants of the GUI design group had a breadth of experiences and expertise. Among the skills the group had were database building experience, search experience on many different systems (online, CD-ROM, and Web-based), knowledge of both intermediaries and end-users, ability to research, usability experience, program management, and use of quick prototyping tools. The group was fortunate to have those skills internally so that the screens could be designed and prototypes created in HTML without having to draw on outside resources.

The group worked well together and drew on their strengths. Although discussions were sometimes heated due to a strong commitment by various members to designing a good functional interface, the group was able to reach a consensus. The mixture of detail-oriented people with broad-viewed people brought in an expanded view for designing the interface. The group was able to time its results so that the input could be given to the contractor, who was designing the new STINET databases on Fulcrum.

Previous to the first actual group meeting, the DROLS Replacement Program Management office (PMO) had held one all-day meeting to decide on the general aspect of the first search screen for the DROLS Replacement. This rough listing gave the PMO an idea of how to organize the data. In addition, at the November 1997 DTIC Users Conference, the STINET Focal Point held a meeting to discuss the STINET interface and what users liked and disliked about it. Also at the 1997 Users Conference, the Marine Corps Intelligence Library discussed the advantages and disadvantages of the current STINET in one of their sessions. Input from these meetings as well as the comments from the STINET Focus Group were the starting points for the GUI Design Group's work.

The group began by going over the twenty page Requirements Document that the DR Search Engine Group had produced in 1997. Since these were the functions that DTIC felt were required in a search engine, the interface needed to be able to support them. The group decided which ones were mandatory and which were desirable for the final "wish-list" system.

The group also researched and reviewed books and articles on the GUI design process and principles, especially for Web design (see bibliography). Members of the group examined a number of Web search interfaces and presented samples of the ones they felt had good features and would be useful for DTIC's search interface. In addition, the group looked at DTIC interfaces such as the new DROLS GUI. The samples were analyzed using the usability criteria developed by Jakob Nielsen, the recognized expert in usability engineering, noting any good points of any particular sample's approach. In the meantime, a subset of the group categorized all the search requirements using index cards and organized the functions by screen in which they would appear, per Nielsen's recommended approach.

The next step was to create some sample screens. Several versions of different levels of interface screens were produced using PowerPoint. The initial types of query screens were Simple, Intermediate, Advanced, Natural Language, and DROLS Command Line. After changes were made, another version of the screens was produced using HTML, so the group could see pull-down screen choices and buttons. More changes were made, and fields for the TR and TEAMS forms were decided upon.

Two sessions of user testing of the functional screens were held. The group used the NCSA Heuristic Evaluation of Defenselink (see bibliography) as a model for a testing approach. All testers tested the interface separately with a set questionnaire listing each part of the interface and specific questions on each. The testers in the first session included thirteen in-house DTIC staff members, with personnel ranging from former field librarians to skilled Web searchers to people with no database searching experience. The second test was made using five local expert non-DTIC searchers who know a mixture of DROLS, other traditional search engines, CD-ROMs, STINET and other Web search engines, and understand the composition of the DTIC user base. The testing was performed in the DTIC training room with each user isolated from the others. The users saw the HTML screens on the training room PCs and filled out questionnaires as they viewed all the functions. General comments were also welcomed. After each testing session, the GUI Group went over all the questionnaires and comments. The screens were changed as necessary to eliminate confusion or comply with suggestions. Where comments were unclear or contradictory, the group tried to interpret the underlying cause of the confusion and make changes to clarify.

At this point, the generalized screens were completed. The STINET Management Division personnel then began to design their screens around the work that the GUI Design Group had done, including design of graphics for the STINET screens. The Group gave the STINET Management Division staff a list of items for welcome and opening pages. They also brainstormed on topics required for the Help screens and came up with wording for some of the Help topics. The members of the GUI Design Group will help to perform usability testing on the STINET screens when they are completed. In addition, both groups of testers of the generalized functional screens (DTIC in-house and DTIC Users Council) expressed interest in testing the real systems when they were completed.

IV. Some major decisions for the Screen Design

In accordance with the approach discussed above, here are some of the major design decisions the group made.

1. Create a range of different screens for different types of users:

a. Quick search (one fill-in box) was aimed at both the novice searcher and the experienced searcher who wants to do a quick simple search. Experienced searchers often do this type of search in order to get a feel for what is in the database before proceeding to a more sophisticated search. This interface has no options. Date ranges, types of display, order of display, etc. are all defaults.

b. Simple Fielded search interface (few fields) was aimed at users who wanted some field searching, but still did not want to be bothered with many options. The idea was to provide an interface similar to a power search on a Web search engine, such as an author/title search, with a few options.

c. Advanced Fielded search interface (most common fields) was aimed at the expert user. It attempted to marry the positive strengths of DROLS searching with the capabilities of Web searching. When the old character-based DROLS interface is no longer supported sometime in the future, this is the interface that those users will probably use. The interface allows options to sort on any field, display multiple formats, Boolean and proximity searching, and presented the most common fields in forms, along with a general search. Other fields not listed in the form can be

searched by indicating the field in the General Field search.

d. Natural Language interface was aimed at end users who want to be able to type in a detailed search question and have the system generate the query. Although none of the search engines DTIC is employing has a good natural language interface, the design team wanted to lay out the interface as a place holder in case DTIC has such an engine in the future.

e. DROLS Search Language interface (fill-in screen for legacy system commands) was aimed at expert users who do not want a form-based interface. It was basically just a box to type in the legacy DROLS command language, simulating the old character-based DROLS interface, with some additional online tools. Some users are very comfortable with that interface, since they know it very well. It is, however, known that there are fewer and fewer of those users left due to library closings and retirements. Therefore, at some point, this interface may not be supported anymore. DTIC did not include this interface in STINET, partly because of the work involved, and partly since STINET is targeted for end-users, not DROSL expert intermediaries. For this interface the legacy names for the DROLS databases were used instead of the descriptive names used in the other interfaces.

As was expected, in the testing sessions, different users liked different screens.

2. Name databases on the screens by their function instead of the DoD acronym, and then explain the full name in Help. The group decided that expert users could easily figure out the name from the function and novice users would not care about the DoD acronym.

3. List all the DTIC databases or multi-database search in a pull-down menu in one place.

4. Create groups of subsets of TR by subject, type of document, or hot topic, so the users do not have to formulate those search queries themselves and can browse this section.

5. Group other special collections, documents, bibliographies, or Web pages by type and topic.

6. Use pull-down menus instead of boxes to list databases.

7. Date searching was a trade-off between giving users default years and making it easy to select any date range. In the end, the need for consistency with the rest of the page and the need for flexibility caused the group to decide on default date ranges and make any other choice a fill-in date range for Advanced Fielded search.

8. Within the data, the fields need to be hyperlinked to bring back related citations. These searches may be within the same database or between databases. Some examples might be to link an AD number in a TEAMS record to a search for that citation, or to link to a search on the author's name in a TR record.

9. The design group tried to look at functions that were not in DTIC's current Web pages, but that users needed. One example was the need for users to display or print a full set of citations (a bibliography) rather than one at a time. Another feature that was required was a shopping cart, which would allow users to order multiple documents at once. A shopping cart is also essential for DTIC's future Electronic Commerce efforts. This requirement was fed into the STINET conversion in time to incorporate it.

V. Recommendations

1. DTIC needs to create a usability elements points document for all of DTIC. This document will give general style pointers for Web page designers in DTIC. It should use Jakob Nielsen's ten points as a guide. The document's use does not need to be mandatory. The goal would be to lay out some common sense guidelines for DTIC Web page design. The document needs to be fairly short in order to be useful to Web designers.

2. The STINET Management Office needs to articulate the organizing principles/style guidelines for STINET pages, so that future Focal Points will know how the products and pages are specified. As STINET gains new products, they need to be added in such a way that they fit into the whole easily enough that users can find them and employ the same general methodology that they use for the other products.

3. DTIC needs to employ both in-house and user testing for new products and services, especially online products. There needs to be functional testing in-house and usability testing by both in-house and by users. Usability needs to be designed into a product up front. It can reduce the recoding of software later in the software's lifecycle when

it is more expensive, can reduce help desk calls, and can give a more useful product to the users. The GUI Design Group members suggest that they form an informal in-house group with knowledge of the principles of screen design for the Web and usability testing. The group would offer their services for usability testing to any project that wants it. The idea is not to slow down the implementation of a product, but to help to produce a quality product that is useful and usable, and needs less work later in maintenance and user help.

4. Examine what was found in the PROCAP effort on Secure STINET to make sure DTIC addresses the user comments. PROCAP is a DTIC effort to call a subset of users and find out their views on a DTIC product or service.

5. DTIC should look at comments in Appendix A, especially the general design comments and the suggestions for DTIC policy.

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Appendix A

Some general lessons learned and suggestions from the User Council testers:

General Design Comments

1. Encourage minimal use of "DTICese" (DTIC specific terms such as "Display Inverted File" and "Corporate author", etc.), and provide explanations of those used, because Web interface users would probably be less likely to be "old-time" DTIC users. Avoid Fulcrum-related terms such as "fuzzy logic".
2. Where to give the users information on the service and how to search: they preferred less wordy pages, and instead, preferred links to obtain the information.
3. Users want to search DTIC for DTIC information. They are not strongly interested in other resources. Users stated DTIC should focus on DoD resources as links with their pages. Other related resources are nice, but not necessary. Pages should be clearly identified and should designate the Non-DTIC resources as distinct from DTIC information.
4. DTIC needs to proactively look for directories, links, and collections of general use to the community. Currently, STINET has a few directories that DTIC has put up, but not a general selection, not directories or collections that anyone has chosen while thinking of user wants/needs. In effect, DTIC needs an acquisitions focus and acquisitions policy for directories, links, and online collections.

Specific Design Comments

1. Would like to see a statement of the scope of the current STINET database stated at the top of the Search Results pages such as: "These items are part of DTIC's collections - unclassified, unlimited, and limited holding from 1985 to the present. Contact your librarian or DTIC for more access to complete DTIC resources."
2. Most experienced searchers disregard the relevancy ranking that any search engine provides. They prefer sorting by date. DTIC needs to provide both.
3. Want specific help screens for each type of search, rather than a general one that pops up for each search.

4. The Users council would like a similar look and feel to all DTIC related pages. Use all the same type font, colors, and design. They do not like the lack of consistency between the DTIC home page and STINET pages. Background colors are important - they do not like the speckled gray background. Pull down menus for choosing databases to search were liked by most of the users. Most defaults were accepted, but the frames were disliked.

5. DTIC's multi-database searching was liked, but some found it to be confusing when the field names used were too generic, without the inclusion of an example or explanation. For example, "Person", used for Personal Author, Principal Investigator, etc. It was suggested to have a matrix of fields searched in each database when using a field in multi-database searching.

Suggestions for DTIC Policy

1. This set of users was interested in a flat fee for document downloading rather than payment per document if DTIC were to institute downloading charges. Whether the payment is flat fee or per document, these users say they are willing to pay for the ability to download. Anything to get paper copy faster is a help. Being able to print documents on demand at their location is just as good if not better than having to wait for a print order to come in the mail.

2. These users do not want the full text to stay up for only six weeks. They might need it after the six weeks is up. They asked us not to tease them with putting up the documents and then taking them down. Disk storage space is cheap. They would rather only have citations, instead of the full text appearing and disappearing. This way they do not know which documents are up and when.

3. These users suggested that DTIC produce a classified CD-ROM, because CDs are very simple to use and it would be difficult for DTIC to put classified information up except on SIPRNET. They really liked DTIC's TR on CD-ROM product. It would solve a lot of problems for them if DTIC provided classified TR on CD-ROM. (DTIC's problem - need-to-know causes too many versions of a classified CD. Perhaps a DoD-only version or a version for those with access to all Fields and Groups?)

4. This set of users really liked searching software of the TR on CD-ROM. It is easy and familiar to them, because it uses software similar to others that they have used. They

would like to know why the DTIC website cannot use the same interface and search engine as other similar commercial databases on the Web. Those interfaces are easy to use and these searchers are familiar with them.

5. There was a concern about DTIC putting up other organizations' pages such as NFAIS, AFCEA. It looks like an endorsement. If DTIC puts the non-DTIC links up, it should put them up with a disclaimer that DTIC is not endorsing them.

Appendix B

The HTML version of the screens are in
http://web.dtic.mil/DROLS/DR_GUI.html. The screen prints on
the following pages do not show the pull-down menus.



Quick Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Browse Terms](#) | [Help](#)]

Choose one of the following :

[**View Database Descriptions**](#)

DTIC Bibliographic Database (Citations Only) ▼

Note: If you select the multidatabase option, expect a slower response time.

Search for:

Defense Technical Information Center

Last updated : 9/11/98



Simple Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

This interface allows you to search a specific database by field. Because fields vary between databases, not all databases can be searched simultaneously. From the menu below select the desired entry.

Choose one of the following :

DTIC Bibliographic Database (Citations Only)



Defense Technical Information Center

Last updated : 10/16/98



DTIC Bibliographic Database Simple Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

Search for:

All Fields:

AD Number:

Author (Personal):

Title:

Max Docs per Page:

Display Format:

Note: Default date is 10 years.



DoD Research in Progress Simple Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

Search for:	Help	<input type="button" value="Search"/>	<input type="button" value="Clear Query"/>
All Fields:	<input type="text" value="contains any"/> <input type="button" value="▼"/>	<input type="text"/>	
Accession Number:	<input type="text" value="contains any"/> <input type="button" value="▼"/>	<input type="text"/>	
Title:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Distribution Code:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Distribution Reason:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Subject Terms:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Display Format:	<input type="text" value="Brief Record"/> <input type="button" value="▼"/>	<input type="text"/>	
Max Docs per Page:	<input type="text" value="10"/> <input type="button" value="▼"/>	<input type="button" value="Search"/>	<input type="button" value="Clear Query"/>



Independent Research & Development

Simple Fielded Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Browse Terms](#) | [Help](#)]

Search for:	Help	<input type="button" value="Search"/>	<input type="button" value="Clear Query"/>
All Fields:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Subject Terms:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Title:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Abstract:	<input type="text" value="contains all"/> <input type="button" value="▼"/>	<input type="text"/>	
Display Format:	<input type="text" value="Brief Record"/> <input type="button" value="▼"/>		
Max Docs per Page:	<input type="text" value="10"/> <input type="button" value="▼"/>	<input type="button" value="Search"/>	<input type="button" value="Clear Query"/>



Multi-Database Simple Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

This interface allows you to search the DTIC Bibliographic Database, DTIC Full Text Database, DOD Work in Progress, and the Independent Research & Development Database simultaneously.

Search for:

Person:

Last name only



Subject Terms:

contains all



Organization:

contains all



Contract/Grant Number:

contains all



Display Format:

Brief Record



Max Docs per Page:

25



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Advanced Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

This interface allows you to search a specific database by field. Because fields vary between databases, not all databases can be searched simultaneously. From the menu below select the desired entry.

Choose one of the following :

[View Database Descriptions](#)

DTIC Bibliographic Database (Citations Only)

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DTIC Bibliographic Database Advanced Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

Search for :

Use: ▼

All Fields:

Accession Number: : (ex. ADA-999999)

Author (Personal): : (ex. Jones, JS)

Corporate Author:

Corporate Author Code:

Title:

Subject: (Descriptors, Identifiers, Title, & Abstract)

Numbers: (Report #'s, Contr. #, Task #, Proj. #)

Report Date: : (ex. 05/1993-12/1997)

 -

Limitation Statement:

Contract Number: : (ex. MDA-903-99-D-0000)

Media Type:

All ▼

Data Type:

All ▼

Display Format: ▼

Max Docs per Page: ▼

Sort by: ▼

Sort by Field: ▼

Note: Default date is 10 years.



DoD Research in Progress Advanced Field Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

Search for :

Use: ▼

All Fields:

Accession Number: (ex. ADA-999999)

Title:

Subject Terms: (Descriptors, Keywords, Title)

Fields and Groups: (ex. 01/02)

Approach:

Objective:

Progress:

Summary Date: (ex. 05/1993-12/1997)

 -

Numbers: (Contr #, PE #, Proj #, Task #, Acct Code)

Distribution Code:

Distribution Reason:

Responsible Organization:

Performing Organization:

Display Format: ▼

Max Docs per Page: ▼

Sort by: ▼

Sort by Field: ▼

Note: Default date is 10 years.



Multi-Database Advanced Fielded Search

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Organization Hierarchy](#) | [Browse Terms](#) | [Help](#)]

This interface allows you to search the DTIC Bibliographic Database, DTIC Full Text Database, DOD Work in Progress, and the Independent Research & Development Database simultaneously.

Search For:

All Fields:

Person: (ex. Jones, JS)

Subject Terms:

Organization

Contract/Grant Number: (ex. MDA903-99-D-0000)

Date:

Display Format:

Max Docs per Page:

Sort by:

Sort by Field:

Note: Default date is 10 years.

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Subsets of DTIC's Collection

[[Quick Search](#) | [Simple Field Search](#) | [Advanced Field Search](#) | [Subsets of DTIC Collection](#) |
[Non-DTIC Resources](#) | [Language Translator](#) | [Thesaurus](#) | [Browse Terms](#) | [Help](#)]

Citations

- Hot Topic Bibliographies
- [DTIC Standardized Subject Categories](#)
- [DISA Core Mission Areas](#)
- [Distance Learning Topics](#)
- [Copyrighted material in DTIC Collections](#)
- [Partnership for Peace Information Management System \(PIMS\)](#)
- [Patents in DTIC's Collection](#)
- [Studies & Analysis Topics \(from MORS\)](#)

Directories

- [How To Get It \(HTGI\) Directory](#)
- [National Federation of Abstracting and Information Services \(NFAIS\) Directory](#)
- [Signal Directory](#)

Specialized Full-Text Documents

- [Advisory Group for Aerospace Research and Development Document](#)
- [DTIC Review](#)
- [Ozone Collection](#)



Non-DTIC Resources

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Choose an individual Resource or the Multidatabase Searching option:

DOE OPENNET Database
DOE Reports Bibliographic Database
NASA Technical Reports Database
NASA Open Literature Database
NASA NACA Technical Reports Database
NASA Goddard Technical Reports Database



Search for:

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